



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

MINOR STUDIES FROM THE PSYCHOLOGICAL LABORATORY OF VASSAR COLLEGE.

COMMUNICATED BY M. F. WASHBURN.

II. A COMPARISON OF METHODS FOR THE DETERMINATION OF IDEATIONAL TYPE.

By ALMA BELL and LORETTA MUCKENHOUP.

The object of this study was to test the mutual consistency of the various methods given in Titchener's Experimental Psychology, Volume I, Part II, pp. 394 to 401, for investigating the type of imagery normal to a given individual. For a description of these methods the reader is referred to the above mentioned volume. Since only two of them, the revised Galton questionnaire and Secor's word method, undertake to discover the presence of images other than auditory, visual or motor, for purposes of comparison these types of image only were taken account of. The plan of the investigation was to test a few observers by as many of the methods as possible in order to see whether the results were in harmony with each other. Four women students of psychology, with a half year's practice in introspective work, were the subjects. Two of them, H., and B., were not tested by Kraepelin's method; and one, B., was not tested by Cohn's method or Washburn's method. Otherwise the accompanying table allows a thorough-going comparison of results.

METHOD.	Observer, Vo.				Observer, H.				Observer, B.				Observer, S.			
	V.	A.	M.	Gen.	V.	A.	M.	Gen.	V.	A.	M.	Gen.	V.	A.	M.	Gen.
Kraepelin's,	.69												1.09			
Secor's Visual,	36	33	2½	22	51	15	0	38	60	17	0	22	58	14		
Secor's Auditory,	44	26	0	24	46	28	0	19	48	26	0	12	51	21		
Binet's, part I, a,	10.4	37	0		0	58	0		56	9	2		52	0	16	
Binet's, part I, b,	0	55	0		0	91	0		13	44	11		38	47	0	
Binet's, part II, a,	12	66	33		45	56	62		64	54	16		33	22	16	
Binet's, part II, b,	27	91	33		50	55	47		64	86	22		100	44	33	
Cohn's,	29	58			58	43							100	95		
		A.V.				A.V.								A.V.		
Washburn's,	11	66	22		0	50	50						20	0	80	

In explanation of the table, the following points should be noted. The results for a given method on all four observers, it will be seen, are to be found in the same horizontal column. The vertical sections of the table belong respectively to the different observers. The vertical columns in each section marked V., A., M., Gen., contain figures representing the value of visual, auditory, motor, and other miscellaneous images for each observer, determined by each method. The figures under V, opposite Kraepelin's method, represent the ratio of the number of objects characterized by color to that of objects characterized by sound, thought of by the observer in five minutes interval. Obviously this ratio, and not the absolute number of ideas occurring to the mind, is the proper representative of ideational type, since the absolute number of ideas depends on the rapidity of the flow of ideas, which may vary quite independently of their type. The figures opposite "Secor's Visual" and "Secor's Auditory" are the percentages of visual, auditory, motor and other images suggested to the different observers, in the one case by the list of words read visually, in the other case by that heard read aloud. Opposite "Binet's, Part I, a," are given the results for this method reduced from "forty-eighths" to percentages for the purpose of better comparison. All the results for the various parts of Binet's method and for Cohn's method are similarly stated in percentages. It will be seen that no figures are given for section (c) in either part of Binet's method. This section, as a reference to the Manual will show, tests chiefly the motor memory by means of nonsense figures. Its omission in our table is due to an error in method. The four observers should have been tested by the same figures; instead of which each of the two experimenters made her own figures, which were considerably more difficult in one case than in the other, so that the results were not fairly comparable. The table as a whole is of value, however, only for the comparison of auditory and visual types, since two of the methods, Kraepelin's and Washburn's, do not attempt to test any other form of image; and this value is little affected by the omission of the nonsense figure experiments. Since the second part of Cohn's method tests the composite auditory-motor type of memory, the percentage figures here are placed between the auditory and motor columns. The results of Washburn's method need a few words of further explanation. This method supposes that it is possible to obtain an objective means of deciding whether a given mistake in addition has involved visual or auditory images. The criterion suggested in the Manual involves putting down as auditory all mistakes where a figure is repeated, as for instance, " $282+20=303$; $569+23=593$." Our experience suggests that these mistakes may perfectly

well be visual; it is quite as possible to confuse the visual images of the numbers in such a way that a number is repeated, as it is to repeat through 'sound echo.' Guided by our own introspection and that of our observers, we adopted the following method of distinguishing between auditory and visual mistakes. (1) Those errors involving the repetition of a figure whose sound was not the same in the two cases were put down as visual, for instance, " $193+16=213$;" " $245+17=252$." Obviously there can be no question of a sound echo here. (2) Errors involving the repetition of a number further back in the series than the two added were put down as auditory, for instance, the repetition of 8 in the following: " $143+8=151$, $151+4=158$;" or of 7 in " $542+7=549$, $549+15=574$." The reason for calling these auditory is the introspective one that even good visualizers do not retain the visual images of numbers any further back than those which they are actually adding, while the sound echo of a number may persist for some little time. (3) Errors involving the repetition of one of the numbers added, where the sound as well as the look of the number remained the same, were put down as auditory-visual, since they might have been due with equal probability to the persistence of visual images or to that of sound images. The results given for each observer are thus the percentages of the total numbers of errors made falling under each one of these three heads: visual, auditory, auditory-visual.

The following conclusions may be drawn from the table:

(1) The methods are, generally speaking, consistent in their results.

Observer Vo. appears to be the most auditory and least visual in type of the four observers. H. comes next, while B. and S. are predominantly visual. It will be observed that Vo. shows a predominance of the auditory over the visual memory by every method except Secor's; that H. shows a similar predominance by every method except Secor's and Cohn's; S. shows a superiority of visual over auditory memory by every method except Binet's, Part I, b; and B. a like superiority by all the methods used on her except Binet, Part I, b, and Binet, Part II, b. As regards these exceptions, we may note that Part I, b, of Binet's method gives the greatest preponderance of auditory over visual memory for all four observers; in the cases of Vo. and H. it is the only one where the visual memory absolutely touches zero. The mode of procedure in this method is for the experimenter to read aloud to the observer series of nine letters each; at the end of each series the observer recalls it and dictates it to the experimenter. No effort is made to control the kind of memory involved. Under these circumstances, then, all four of our observers found it more

natural to be guided by the persistent sound image of the letter than by its imagined look, which is not to be wondered at when we remember that the sound images are occasioned by the actual utterance of the sounds, while the visual images are merely suggested both in the recall of the series and in its first presentation. The difference in type between our four observers is evidenced by the fact that Vo. and H. had no visual imagery involved, while B. had a small amount and S. nearly as much visual as auditory imagery. An important difference exists between Parts I and II of Binet's method which affects comparison of their results. The figures under V. and H. in the case of Part I represent the natural uncontrolled tendency of the mind under circumstances favoring, for (a), visual memory, and for (b), auditory memory. The figures similarly placed in the case of Part II represent the results of an effort to recall in visual or in auditory terms, the conditions favoring as before (a) visual and (b) auditory images. All the observers seem to have visualized better when they made an effort to do so; the effect of intentional use of auditory images is not so marked. It is a curious fact that three observers succeeded better at deliberate visualizing in Part II (b), where the conditions favor auditory imagery, than in (a) where visualization is favored; while the fourth observer, B., did as well in one case as in the other. Probably the fact that memorizing a nine-letter series is an easier problem than memorizing a twelve-letter square helped to produce this result.

(2) The method which in this test gave least satisfactory results was Secor's. The series of words suggested in the Manual, like the others used in our experiments, does not offer equal opportunities for visual and for auditory associations, and the results could not be expected to be trustworthy as an absolute measure of an individual's mental type; however if, as was here the case, the same series is used on different individuals, it should be possible to obtain a comparison of the tendencies of these individuals. It will be seen from the table, however, that the four observers showed less difference in the results of tests by this method than in those made by any of the other methods. In "Secor's Visual," observer Vo. displays her characteristic auditory tendency in the ratio V:H::36:33, where all three of the other observers show much greater preponderance of visual over auditory images. But in "Secor's Auditory" the results from all four observers are very nearly alike. The root of the difficulty with Secor's method, the source of its defects, lies probably in the fact that it requires the exercise of perfectly indefinite and uncontrolled processes of association. All the other methods demand of the observer the revival of certain fixed and specified material,

letters, numbers, etc.; the variations in the results are due wholly to the mode of revival. But where words are used and allowed to suggest images freely, the process is bound to be complicated by all the influences which determine the play of associations. The recent experience of the observers will be a disturbing factor; if one has just seen a picture of a conflagration the word 'fire' may suggest the picture, although, under ordinary circumstances, auditory imagery would be called up. Then the nature of the imagery suggested by one word may affect that suggested by the next: if 'fire' calls up a visual picture the following word may also suggest a visual image; if the idea called up by 'fire' be auditory the idea called up by the next word may be auditory, too, and so on.

Finally, it is interesting to compare the results of these relatively objective methods with the introspective testimony of the four observers as to their mental type, given in answers to the questionnaire on pp. 198-200 of the Students' Manual (Vol. I). Observer S., one of the good visualizers, judged by the results in the table, declares herself able to call up the picture of the rosebuds, etc., very vividly, and to the question, "Is the image as bright as the objects would be if they lay on the table before you?" answers, "Yes, of course." B., the other good visualizer, says, "I think the image is as bright as the objects themselves would be." Both S. and B. place the visual experiences first in order of vividness among those mentioned on page 200. Both say that they do not recall music easily and that imagined music does not play any considerable part in their mental life. H., less visual and more auditory by the other tests, says of the imaged rosebuds, "At times the image is as bright as if the flowers were before me, but it becomes blurred in a very short time." She also states that if she fixes her attention on one part of the image the other parts become blurred. B. says, "no part of the image is blurred, though the flowers lying on the ferns are the most prominent part." S. says the image is all clear, though "one side of the box is shaded on the inside." H. says she can recall music easily, and that imagined music is often disturbingly real to her. She can see the words of the national anthem printed, but only when she imagines herself repeating them at the same time. She does not, however, note any marked difference in the vividness of auditory and visual images in the series on page 200. V., the most strongly auditory and least visual of the four, according to the other methods, although she does not find any special defect in her pictures of the rosebuds, places auditory images first and visual images last of all in point of vividness among the experiences named on page 200. In answering the questions on the national anthem, she says, "Effort

is necessary to see the words printed." She recalls music easily and has a great deal of musical imagery.

On the whole, then, the questionnaire results support those of the other methods. One point, however, should be noted. Observer H., though her auditory imagery seemed to be better than her visual imagery by most tests, declares that she uses the latter constantly in her ordinary thinking. This is evidence of the fact that in determining mental type tests of the vividness of a certain kind of image should be distinguished from tests of the frequency of its occurrence. A person may have a mediocre power of visual imagery, measured by the definition and vividness of the pictures called up, and yet may think habitually in visual terms.